The mission of the Information Processing Group is to provide leadership and expertise in information theory, coding theory, and communications systems, in line with the missions of JPL and NASA. Our work ranges from fundamental research on performance limits to practical details of infusing and supporting our technology on flight missions.

The group conducts research and development in the following broad areas:

- **Channel coding.** Our goal is to design low complexity forward error correcting codes that have performance near the Shannon limit. We led the effort to standardize a family of turbo codes for deep space communications. We are currently developing low density parity check codes, which may have even lower complexity. We also have renewed an interest in coding for optical channels.
- **Data compression.** We have recently developed a progressive wavelet image compression algorithm, ICER, which has been implemented as the compression technology for Mars Exploration Rover. We are currently investigating techniques for compressing hyperspectral image data.

- **Modulation.** The desire for higher data rates is leading to spectral crowding, especially at X-band. We are investigating a number of power efficient, spectrally efficient coded modulation schemes to solve this problem, and we are active participants in related standards organizations.

- **Systems analysis.** We provide expertise in the end-to-end performance of communications systems, including analysis of statistical channel models, link continuity, radio losses, and weather prediction.

We also consult with current or planned NASA missions, and sometimes non-NASA projects, on these topics when critical issues arise. We sometimes play a role in the hardware development and implementation of channel decoders and data compressors.